rearing their young in the New Zealand forests, to which country they periodically return for the summer season. Such, for example, are the long-tailed cuckoo and the small bronze-cuckoo, known to the Maori as "the bird of Hawaiki"—that is, the bird who returns to the land from whence the Maori ancestors originally came.

Our kingfisher also moves northward in the autumn, and may likewise leave for a warmer country. These latter birds conduct their migrations as we should expect—that is, they reverse the conduct of their flight to those birds which live in northern latitudes, and we feel that their natural instincts are working according to rule. But the kuaka, not satisfied to pass the winter in a warmer country, must actually have two summers—one in New Zealand and a second in Northern Siberia, where it is said to have its breeding-place. Any way, it leaves in countless numbers from the north-east point of New Zealand, from almost the very place where the spirits of the dead Maori are supposed to take their departure to the other world (Reinga). For which reason the bay on the shore of which the birds assemble before flight is named by Europeans "Spirits' Bay."

The Polynesian mariner may in former times have guided his migrations by observation of the place of departure and arrival of birds of passage, also from the particular dates of such occurrence, and from the circumstance that the winds at that time were most favourable for travel in such particular directions. The spirits of their dead may have been supposed to return to the original birthplace of the race; and the nearest point of departure would be that from which the birds also departed.

But do any migratory birds other than the kuaka go further north than Tahiti, Rarotonga, Samoa, and the Fijis?

I always understood that no bird from either the north or the south temperate zones ever voluntarily crossed the tropics, and to me it seems a fable that even the kuaka should do so.

Whence comes the hereditary knowledge that should lead the kuaka half over the world to find a suitable breeding-place? Why does it not go in search of an Antarctic continent, as should be the natural sequence of events? Are not the high lands and alpine valleys of New Zealand where the dotterel, the red-breasted plover, the stilt-plover, oyster-catcher, &c., make their nests, equally suitable for the godwit?

Where does the European godwit (*Limosa lapponica*) breed? and is it not said that the nesting-place of the European knot (*Tringa canutus*) has never been discovered?

That the New Zealand godwit starts in a northerly direction in its migration is assured; but who has traced its course onward, as following the shores of China, it is making its way to lonely steppes in Siberia?

That these birds should winter during a New Zealand summer, and then leaving should pass through both temperate and torrid zones, and still onward to the confines of the north frigid zone to nest and summer, is truly marvellous. Will any reader of NATURE kindly contribute to our knowledge of the nesting-place of the godwit or the knot, or remark on other points at issue?

TAYLOR WHITE.

Wimbledon, Hawkes Bay, N.Z., February 9.

In reference to the above, the British Museum possesses a single egg of the knot, said to be one out of a clutch of four obtained at Disco Island, Greenland. Colonel Feilden has good grounds for believing that this bird nests in the New Siberian Islands.—ED.]

The Indian Musk-Shrew.

THE old yarn about the tainting of wine in bottle by the common Indian shrew (*Crocidura coerulea*)) seems to die hard, since "W. T. B." has had to correct it again in your issue of this week. The account of a crucial and deliberate experiment may be another nail in its coffin.

I kept wine in small chambers off my office, in a locked basket, ventilated at the ends, for use at luncheon. One day I opened it, and found a musk-shrew coiled up on a napkin, and did not disturb him, nor he himself. Next day I impanelled an unconscious jury; and we found the wine perfectly good. The musk-rat had been there in the morning, but had received a quiet hint to go. When my guests were gone, I wiped a glass with his napkin, filled it with wine from the same bottle, and found this too musky to swallow.

The wine was a sound Pommard from Treacher and Co., Bombay, with capsuled corks bearing their stamp.

I do not know whether it was bottled in Europe or in India.

I believe that the commonest cause of the musk-taint in wine is the wiping of the glass with a clout that has been picked up out of a corner, where the musk-shrew has laid on it.

Even in the best houses in India native servants will often use very little care about the cleanliness of "glass-cloths"; and when one that has served to clean a lamp or shelter a shrew is next used upon a wineglass, you have *vera et sufficiens causa* for spoilt wine—and temper.

I have a note on this somewhere in the *Journal* of the Bombay Natural History Society; but it is buried out of sight in some back volume, as my experiment took place about twenty years ago. I may add that the place of it was Ahmadabad, in Gujarat.

W. F. SINCLAIR.

102 Cheyne Walk, Chelsea, London, S.W., May 5.

Mammalian Longevity.

SINCE my letter on this subject in NATURE of March 23, I have noticed that a slight change in the formula—the reduction of the constant from 10·5 to 10·1—gives much better results. The agreement is now very close indeed. The amended statement now runs as follows:—

The full term of life in any mammalian species is equal to 10·1 times its period of maturity divided by the cube root of the period, or 10·1 times the cube root of the square of the period.

We get the following results from its application:—

Animal.	Observations. Authority.	p. m.	f. t. l.	f. t. l. by formula.	Other observations. f. t. l.
Dom. Mouse ..	Dr. Ainslie Hollis.	·25 yr	4 yr.	4 (4·01)	
Guinea-pig ...	Flourens.	·583	6–7	7 (7·05)	
Lop-Rabbit—					
Buck... ...	R. E. Edwards.	·75	8	8 (8·3)	
Doe	R. E. Edwards.	·67	8	8 (7·7)	
Goat	Pegler.	1·25	12	12	
Fox	St. G. Mivart.	1·50	13–14	13·25	
Cat	Jennings.	2	15	16	
Cattle	Dr. Ainslie Hollis.	2	18	16	14, Gresswell. 15-20, Flourens.
Large Dogs ...	Dalziel.	2	15	16	15-20, Flourens and others.
Thor. Horse ...	Dr. Ainslie Hollis.	4·5	30	28	
Pigs	James Long.	5	30	30	
Hippopotamus	Chamb. Encyc.	5	30	30	
Lion	St. G. Mivart.	6	30–40	33	
Hunter... ...	Blaine.	6·25	33	34	
Arab Horse ...	Dr. Ainslie Hollis.	8	40	40	
Camel	Flourens.	8	40	40	
Man	Buffon.	25	90–100	86	100, Flourens. 75, Farr.
Elephant ...	Darwin.	30	100	98	
Elephant ...	C. F. Corder and Indian hunters.	35	120	108	100, Darwin.

In this table, p. m. stands, as before, for period of maturity, and f. t. l. for full term of life.

In the first table another statement dealing with the cat was also given, on the authority of Dr. Mivart, which is excluded from this, since the period mentioned—one year—obviously refers to the animal's period of puberty, not its period of maturity, as is indicated by Dr. Mivart's expression: "The domestic cat begins to be ready to reproduce by the end of the first year of her life. . . ."

The age of the hunter, calculated from Blaine, was given in the previous table at thirty-five, and in this it is given at thirty three. Blaine states that a horse of thirty years is relatively as old as a man of eighty, and a horse of thirty-five as a man of ninety. The first formula gave about ninety for man, and the corresponding age for the horse was therefore thirty-five; but the corrected formula gives eighty-six for man, which corresponds to thirty-three in the horse.

I agree with Dr. Ainslie Hollis that Buffon's 90–100 years for man is too long; but, on the other hand, seventy-five—the period given by Dr. Hollis from Dr. Farr's calculations—seems much too short. The great majority of persons have their lives cut short by disease, the nervous strain of life, &c., and do not live to anything like the full term of life. Were it not for such influences as these, most persons at seventy-five would probably still possess a considerable degree of vitality, and should be able to look forward to many years of life. Furthermore, Farr's cal-

culation is based on what seems a faulty method. The average of life, about fifty years, is taken, and the expectation of life (in reality a somewhat larger figure), twenty-five years, is added, making up seventy-five, the manifest assumption being that the full term of life of a species is equal to its *average* life plus the *expectation of life* at that age, a conception for which I know of no physiological justification. Eighty-six to eighty-seven years, the period given by the formula, probably represents with fair accuracy the average age at which people would pass from life by senile decay if their lives were not shortened by deleterious influences and conditions. ERNEST D. BELL.

"Primitive Constellations."

REFERRING to your reviewer's hostile notice of my work, "Primitive Constellations," I have seldom realised the strength of my general position until I have seen some attack on it. Against my main contention, *i.e.* the identity of various Greek and Babylonian constellations, he has nothing to say, except that I start with my "theory ready made." Really, he does me much honour. Am I the inventor of the "theory" that, *e.g.*, the signs of the Zodiac were derived from Babylonia? But, leaving nine-tenths of the book with merely a little abuse, he has much to say on the transliteration of Babylonian words, and expresses great scorn because, following Prof. Sayce, I deliberately write *sa*, and not *sha*, and so on. He says I "really ought to know there is no *h* in Assyrian." Indeed. I am at present away from books, but happen to have Sayce's "Assyrian Grammar" at hand. At p. 46 I read, "*a, ha*  . . . *h.*  , *ah, hi, h.*" Again, I am perfectly aware of the force of "the determinative particle *ki*," and, in a book for general readers, have naturally chosen to write "Barsipki," not "Barsip^{ki}," "Suanaki," "Tintirki," &c. If the critic had endeavoured to refute my general proposition, or had carefully examined my treatment of any particular constellation figure, *e.g.* the *Arrow*, how much more useful it would have been. But a policy of pin-pricks does not venture on this.

Berry Pomeroy, Boscombe, April 18. R. BROWN, JUN.

THE writer of the review did not suggest that Mr. Brown had discovered the Babylonian origin of the signs of the Zodiac. The theory which the reviewer laid to his charge was to the effect that the Greeks of the pre-Homeric and Homeric ages had a full knowledge of the constellations known to their descendants in Ptolemaic times; and, further, that they obtained such knowledge at this early period from the Babylonians through intercourse with the Phœnicians and the "Hittites." It is from this theory that the reviewer entirely dissents. Mr. Brown's wholesale assertions that representations of animals in early Greek art are astronomical symbols it was thought might be charitably explained by supposing that he began his studies with this part of his theory "ready made." Of the two cuneiform signs which Mr. Brown cites as proving the existence of the *h* in Assyrian, the first only represents the vowel *a*, the second is only used to indicate the smooth breathing; that he should rely on a grammar published more than twenty years ago shows that he has not made himself acquainted with the recent literature on this subject. It is satisfactory to learn that Mr. Brown is aware of the force of the determinative particle *ki*; but to transliterate such a determinative (which was not pronounced) as though it formed a syllable of the word to which it is attached is, to say the least, misleading—particularly so in a book for general readers. Mr. Brown's numerous blunders in citing Hebrew, Phœnician, and Assyrian words, show that he is not acquainted with these languages at first hand; and it was stated that such a knowledge is essential to a writer who treats the subject of Babylonian astronomy from the linguistic side.

THE ROYAL SOCIETY SELECTED CANDIDATES.

THE following are the names and qualifications of the fifteen candidates selected by the Council of the Royal Society, to be recommended for election into the Society this year:—

W. F. BARRETT,

F.R.S.E., M.R.I.A., Professor of Experimental Physics in the Royal College of Science for Ireland, Memb. Physical Society, Royal Dublin Society, and of General Committee of the British Association. Author of numerous original investigations and papers; amongst them are:—"The discovery of certain physical phenomena produced by the contact of a hydrogen flame with various bodies, and its application as a delicate chemical re-agent" (*Phil. Mag.*, November, 1865); "The discovery and investigation of a serious source of error in the determination of the absorption of heat by liquids" (*ibid.*, September, 1868); "The discovery and investigation of sensitive flames" (*ibid.*, March and April, 1867); "The application of sensitive flames as a delicate acoustic re-agent in illustrating the laws of the reflection, refraction, and interference of sound-bearing waves and the detection of inaudible vibrations" (*Proc. Roy. Dubl. Soc.*, January, 1868; *Science Review*, April, 1867; NATURE, May, 1877); "The discovery of recalescence and other molecular changes in iron and steel when raised to a bright heat" (*Phil. Mag.*, December, 1873; Brit. Assoc., 1890); "The investigation of the molecular changes accompanying the magnetisation of iron, nickel, and cobalt, and the discovery of the retraction of nickel, and the elongation of cobalt by magnetisation, with the determination of its amount" (*Phil. Mag.*, December, 1873, and January, 1874; Brit. Assoc., 1873, 1874, and 1882; *The Electrician*, October, 1882; NATURE, October, 1882); "The investigation of the magnetic properties and the determination of the physical constants of various alloys of manganese steel" (Brit. Assoc., 1887 and 1889; *Proc. Roy. Dubl. Soc.*, November and December, 1889, March, 1886, and in *The Electrician*). Also brief papers on the spheroidal state (*Proc. Roy. Dubl. Soc.*, December, 1877); on the magnetic properties of columnar basalt (*ibid.*, December, 1889), and on the magnetic moment of ingots of manganese steel (*ibid.*, December), &c.

CHARLES BOOTH,

Hon. Sc.D. (Camb.), Merchant and Shipowner. As having applied Scientific Methods to Social Investigation, exemplified by:—(1) A Study of Changes in the Occupations of the People in England, Scotland, and Ireland, from 1841 to 1881 (*Journ. of Statistical Soc.*, 1886); (2) A Study of the Condition of the Aged Poor in England and Wales from Official Statistics and Extended Private Enquiry ("The Aged Poor," Macmillan, 1894); (3) A Study of the Condition of the People of London, 1889 to 1899, in twelve volumes, of which nine are already published ("Life and Labour of the People in London," Macmillan).

DAVID BRUCE,

M.B., Surgeon-Major, Army Medical Staff. Has made important investigations relating to the nature and causes of Malta Fever, and discovered the micro-organism which is the cause of that disease, and proved its nature by experiment. Has successfully investigated the endemic disease of horses in Zululand, and proved the agency of the Tsetse Fly in producing it. Author of the following papers: "Discovery of a Micro-organism in Malta Fever" (*Practitioner*); "Sur une Nouvelle Forme de Fiévre rencontrée sur les Bords de la Mediterranée" (*Annales de l'Inst. Pasteur*); "On the Epidemic of Cholera in Malta during 1887" (*Trans. Epidem. Soc.*); "Report (to the Governor of Natal) on the Tsetse Fly Disease or Nagana" (1897); and a previous Report on the same subject; "Ueber die Virulenzsteigerung des Cholera Vibrio" (*Centralblatt f. Bacteriologie, &c.*). Eminent in Pathology and Bacteriology.

HENRY JOHN HORSTMAN FENTON,

M.A. (Camb.). Author of several papers on the action of hypochlorites and hypobromites on urea and other nitrogen compounds. Has made the remarkable discovery that hydrogen peroxide, although inactive alone, in presence of an iron salt, at once oxidises tartaric and other similar acids, carbohydrates, &c., giving rise to very characteristic products—a discovery of special importance in connection with plant metabolism, which he has elaborated with particular skill and thoroughness. His results are described in the following papers:—"Oxidation of Tartaric Acid in Presence of Iron" (*Trans. Chem. Soc.*, 1894); "A New Method of obtaining Dihydroxytartaric Acid, and the use of this Acid as a Re-agent for Sodium" (*ibid.*, 1895); "New Formation of Glycollic Aldehyde" (*ibid.*); "The Constitution of a New Dibasic Acid resulting from the Oxidation of Tartaric Acid" (*ibid.*, 1896); "A New Synthesis in the Sugar Group" (*ibid.*, 1897); "Properties and Relationships of Dihydroxy-tartaric Acid," I. and II. (*ibid.*, 1898); "The Oxidation of Polyhydric Alcohols in presence of Iron" (*ibid.*, 1899).